

Episode 293

What is Passive House Accelerator? – with Zack Semke

The show notes: www.houseplanninghelp.com/293

Zack: I think about climate change every day when I wake up. I think it's the challenge of our generation and it's both scary in terms of its potential impacts on humans and on the planet, as well as exciting. We have an opportunity to change the course of our economies, and of the way that we create energy and the way that we use energy.

So, it's fairly all-consuming I'm afraid, for me.

Ben: I see as well that a lot of your work is to do with just trying to get information out there to others. Why do you think this is your superpower, where you are?

Zack: I don't know if it's my superpower, but you're right. I'm very passionate about that. Not to dive deep into the energy transition right away, but it's really about the power of learning.

I was introduced to Passivhaus about ten years ago when I started working with a company called Hammer in Hand which is a construction company based in Portland and Seattle that at the time was pioneering Passivhaus in the Pacific North West of the United States. That was my entrée. Before then, I had done environmental policy work and also performing arts. So, I've had a really crazy career.

But what I saw with Passivhaus was that this was an example in an industry where innovation has been famously lagging – the productivity graphs that you see – I don't know if it's McKinsey or some big consulting firm that had that famous report showing that we haven't been innovating very much compared to other industries. Buildings are a laggard. In that kind of context, Passivhaus is all about innovating. It's about using physics to figure out how to design and construct buildings better.

That notion of almost reconceiving buildings as a technology in some ways you could even say. The skeleton and the skin of the

building, I mean. Not the twentieth century version of stuffing poorly performing buildings with a whole bunch of mechanical equipment in those buildings to make up for it. That's almost the story of modernism in architecture. Passivhaus says no, let's step back and take a look at the actual building itself and make sure that we're dialling that in as smartly as we can and optimising it for heat, moisture and cost.

When you start conceiving of something as a technology then the power of learning becomes super important. So, I think probably a lot of listeners are aware of just the astonishing drop in cost of solar energy, of batteries, of wind. It's phenomenal. In the last ten years the cost of solar energy has gone down by a factor of five and now we're at a place in many parts of the world where it's actually cheaper to build a new solar energy production facility than it is to operate existing coal fired power plants. That's really powerful.

The reason that has happened is what's called Wright's Law or sometimes Swanson's Law – basically, the Learning Curve Law. This applies to all technologies and it says that every time you double a technology, the learning that's involved, all the little micro innovations that happen all across the supply chain for that technology, the learning that's involved reduces the cost of that technology by some increment. And in solar energy it looks like that increment could be as high as thirty percent. So, every time we double the number of solar panels around the world, the cost of solar power goes down by thirty percent. So, it's driving mind blowing changes in cost.

So, if that's true for that technology, we can apply the same principles to Passivhaus and buildings. We're probably not going to see that thirty percent reduction in cost but there's no doubt that as we get more experienced at doing Passivhaus, that we can drive the cost of these buildings down closer and closer to cost parity with conventional construction. Some even argue that we can get lower; I don't know if that's true. But that's why I'm so passionate about facilitating communication and flow of information between practitioners, policymakers, marketers and whoever it is because we want to accelerate this process as much as we can so that when a project happens in the UK and there are lessons learned from that project, we can see that learning being applied in Seattle for example. We can all have our shoulders to the flywheel, all as one global community.

Ben: Yes, it's one of the great things about the Passivhaus community, and I continue to learn. I don't get everything. I'm not one of the hugely technical people.

Zack: I'm right there with you.

Ben: Good. Not just me. But I think what I really like is that so many buildings have been built in the past without thinking about the physics. And this just brings that together.

Zack: It really does. I think that has been such a critically important contribution to the broader sustainability or green building movement, that the focus on understanding of physics and then also the development of tools like PHPP or WUFI Passive that help with the design of these buildings has meant that we know what we're getting.

With some green buildings – I'm not going to name names – green building standards that are not Passivhaus, there's a performance gap. There's modelled performance that people expect but the actual performance on the ground or in the dirt can be much worse. And part of that is that a lot of these systems don't understand the role of thermal bridging. It's more rule of thumb stuff. I think that has been such a critically important contribution.

I guess the other piece of that is that Passivhaus doesn't require a PhD or a tremendous amount of expertise in modelling. The tools are optimised in their complexity. They're not too complex and they're not too simplistic for the task. So, it's the right tool for the job.

Ben: You talked already about going hand in hand with the clean energy and Passivhaus. If the costs do come down, what does that mean for the status quo? This may be a broader question here, but the fossil fuel industries, are they just going to sit back and say, 'this is a good idea'?

Zack: No. Well, I think it depends. I do think you see some fossil fuel majors that are at least purporting to embrace the goals of the Paris Accord. Others are simply going bankrupt.

I think that the beauty of this is the agency that it gives us as practitioners, as architects and designers and homeowners. Because really this is all about demand destruction. We need to destroy demand for fossil fuels. And when we are successful at destroying demand for fossil fuels then the price of oil and coal goes down. And if it goes down far enough then it simply becomes uneconomic for these companies to spend their time, energy and money extracting that resource. You get stranded assets.

I think that the COVID experience this year has been a perfect example of that with tremendous demand destruction happening

earlier this year as we all hunkered down and stopped travelling, and the price of oil actually going into negative territory, short-term oil futures going into negative territory. So, if you had a ship full of oil, you had to pay somebody to take it.

So, yes, I think that we know there is a big struggle and there have been decades of misinformation coming from the fossil fuel industry, but I think that things feel like they're beginning to shift.

Ben: Let's bring it back to our industry then. What's the landscape like where you are? It's one thing building a passivhaus, getting it, and your own business or your own company starts that journey. But is that happening all around you? You don't want to rush it and get it wrong is the other thing.

Zack: That's a good point. I feel so impatient about the uptake of Passivhaus. That said, there are some really great examples of market-wide transformation going on.

In Vancouver BC – I'm in Seattle so, it's just a couple of hundred miles away – there's an explosion of passivhaus happening thanks to enlightened public policy that is incentivising Passivhaus or net zero construction. Passivhaus has just taken off like crazy there.

In the US, it's more of a patchwork. New York City is definitely a leader. They have a local law that will be imposing carbon emission restrictions on existing buildings. So, a huge proportion of the buildings in New York City will need to do deep energy retrofits. That's going to have a really big, accelerating impact on Passivhaus retrofits which is exciting.

In Seattle, I've been involved in policy advocacy for years now. I think Seattle has an image for being a liberal, green town and that's true in some ways for sure, but the scalability discussion has not really taken hold. So, we have green building policies that at the top incentivise the Living Building Challenge, which is fantastic. But those incentives have not resulted in a broad uptake of living building design or construction among the development community.

I submit that the reason for that is that it's expensive and harder to scale. The Living Building Challenge was never meant to be something that scaled up quickly. It was meant to be a challenge. It was meant to be like the moon-shot of green building. Passivhaus on the other hand is dialled in to be cost optimised.

So, I think that as cities become actually serious about delivering on climate goals, they'll recognise that there is no other green building standard or approach that rivals Passivhaus on reducing

operational carbon emissions. So, I do think that there's going to be a wave of uptake.

Interestingly, one of the hotspots of Passivhaus right now in the United States is for affordable multi-family buildings in Pennsylvania. The reason for that, is that the state affordable housing body, the Pennsylvania Housing Finance Agency, prioritises projects that are Passivhaus in their scoring of projects that are looking for funding. It doesn't cost the state anything to make that priority and developers can choose to include Passivhaus in their plans or not, but they know that if they do, they're going to get a competitive edge in getting funding. So, that's resulted in this wave of Passivhaus construction in Pennsylvania for affordable housing.

The thing that's pretty amazing about that – and I think this is partly due to the learning curve that I was talking about earlier and also partly due to the fact that this policy encourages project teams to make Passivhaus pencil at the very earliest stages of design – the story of integrated design in green building is that you need to do it early if you really want to harness the power of that process – the average construction cost of the Passivhaus proposals was one-hundred-and-seventy-three dollars per square foot. The average cost of the conventional proposals was one-hundred-and-seventy-five dollars per square foot.

So, the average cost of the Passivhaus proposals was actually lower than conventional buildings according to the PHFA data.

Ben: And is that as well embracing things like simplicity of design?

Zack: Exactly. Simplicity of design is key, thinking about when you invest in the envelope, it means that you can save on mechanical equipment. So, there's that cost optimisation thing that's going on.

But I think that when you get to a place where Passivhaus is equally expensive or perhaps cheaper than conventional construction, it really becomes a no-brainer. Because when we're talking about affordable housing, we're also talking about providing healthy environments for occupants and lower energy bills, all the non-climate action benefits of Passivhaus that are being equitably distributed. It's not that we're just slapping up cheap housing that has poor indoor air quality.

In Pittsburgh, for example, there is still plenty of fossil fuel generated energy and pollution in the air. So, to be able to be in a

passivhaus means lower asthma rates, healthier kids, and all sorts of benefits.

So, that's a shining example. There are other states that are following suit.

Ben: You mentioned the Living Building Challenge a little while ago. One thing that I think is great about that is clearly the embodied carbon in those buildings. It may be taken to an extreme, but where you are, how important is the embodied carbon?

Zack: It's incredibly important. Operational carbon is the first thing that we need to tackle in my view, but just like so many things in the climate action space, it's not an either/or conversation.

It's so tempting to say this is the right way and this is not the right way. The fact is, we have to tackle operational carbon and embodied carbon as well. We're building a New York City every thirty or forty days or something for the next decades. There's so much construction going on. If we can't figure out how to reduce embodied carbon, then we're in trouble.

Actually, the International Living Future Institute's Living Building Challenge is the moon-shot, but it also has a new zero carbon certification that is designed to be scalable and plays really nicely with Passivhaus. It's one of the first standards that's really starting to tackle embodied carbon, measuring of the embodied carbon of the building, looking at how to reduce that and offsetting it.

The Passivhaus community is absolutely embracing embodied carbon as a challenge that we have to address. Whether that ends up being addressed directly in the certification is another question, but I do know that organisations like the Passivhaus Institute are dedicating some serious resources to researching embodied carbon and then thinking about tools to address it.

One of the interesting contributions that organisations like PHI can make are dialling in the energy related embodied carbon calculations. So, really looking at, we're making these design decisions to make this project a passivhaus. How do we then look at the embodied carbon implications of those decisions and make sure that we are trending towards zero on that embodied carbon?

So, it feels like this is very much in its early stages but what is interesting is that even though we don't know everything, we're far from knowing everything about the embodied carbon of materials and it's complicated, there are some basic moves around steel,

around the structure, and around concrete that sound like they can make a really big impact.

So, some early insights already I think are helping designers really bring down the embodied carbon of their projects.

Ben: I see it all coming together. It's got to all come together at some point. Just what you don't want to do is dilute all of the good stuff that you've got so far. That's the hard bit. And when all of these things come together – and this might be a question for you with the cost – the costs can go up then. So, how do you keep the costs down? Is it a matter of just doing it and then over time the costs will fall?

Zack: I can't speak as much to embodied carbon in terms of cost. My suspicion is that a lot of this is simply asking the right questions. Huge progress can be made just by being somewhat informed about your decision-making around embodied carbon.

In terms of the cost of Passivhaus, absolutely as we do more of it, the costs will go down. To me, that's part of the story of the Pennsylvania Housing Finance Agency. You hear the story told by project teams all the time. Like, 'my first passivhaus was ten percent more than my conventional projects, but my second one was five percent more'. You can see that trending down.

Also, the whole supply chain for components. When Passivhaus was starting in the United States ten, fifteen years ago, triple pane windows were crazy expensive. That's changing. There are still issues where we're not able to get our hands on a small enough heat pump, but as that changes and as manufacturers also start doubling the number of Passivhaus sized heat pumps that they produce, the cost for them will go down.

So, like any technology, it's proven that as we do this more, we get better at it and it becomes cheaper. For sure.

Ben: Tell us about Passivhaus Accelerator and how that's going.

Zack: It's a dream project for me. I feel so lucky. Michael Ingui, who is a well-known Passivhaus architect in Brooklyn, in Manhattan, it's his baby. He started the project a little over a year ago and I joined a year ago.

The Accelerator is an open source global platform for sharing Passivhaus information and innovation. It's part aggregator of awesome content that others have created about Passivhaus. It's a community; every Wednesday we do a global Passivhaus Happy

Hour where people from around the world – although it's tough time zone wise for you in the UK and really hard for Europe, but we have a lot of North Americans and folks from Australia and New Zealand joining every week to hear a fifteen minute presentation from a leading practitioner or Passivhaus leader, and then a really lively question and answer discussion on screen. We have two-hundred people or more joining us every week for that.

Ben: We can catch up on replay. That's the other thing.

Zack: That's right, yes. Absolutely. We record all of those and you can see the whole thing if you really want to immerse yourself in the conversation or you can just view the presentation itself.

We do a podcast, we do special roundtable. So, just a lot of opportunities to convene people and share stories and share lessons learned. And during this time of COVID, just on a social and human level, it's been really nice to connect with people. I know we all have Zoom fatigue, so there's that, but we throw it into small group sessions, break out rooms so that people can actually have one on one conversations and it's been a real bright spot for me for sure during this time.

We're working on a new version of the website so that we can do a better job at sorting the existing articles and resources so that if somebody is interested in, say, indoor air quality and Passivhaus, they can come and go to a page and see some of the best writing about that topic from around the world.

I feel like my career has been leading up to this role. It's super fun and rewarding and exciting.

Ben: Well, we all fit into the puzzle, don't we? We've all got to keep on trying. So, keep up the good work at your end please. Zack, thank you very much.

Zack: Thank you. Likewise, Ben.